Department of Conservation
California Abandoned Mine Lands Forum
801 K Street
Sacramento, CA 95814

February 19, 2004

Meeting Notes

Facilitator: Carol Atkins, Harris and Company

Meeting Summary: Cecilia Aguiar-Curry, Harris and Company

Attendees:

Charlie Alpers, USGS
Dustin Bambil, LWA
Thomas Bawden, USACE, San Francisco
Dave Beauchamp, Dept. of Conservation
David Bieber, Geocon Consultants
Janine Clayton, US Forest Service
Doug Craig, Dept. of Conservation
Eileen Fanelli, East Bay M.U.D.
James Gusek, Golder Associates
Sam Hayashi, Dept. of Conservation
Cookie Hirn, SWRCB
Rick Humphreys, SWRCB
David Lawler, BLM/AML
G. Fred Lee, G. Fred Lee Associates
Stephen Lofholm, Golder Associates
Emil C. Meacham, US Forest Service
Leroy Mohorich, BLM
Eugene Mullenmeister, Shaw Environmental
Jerry Olson, BLM
Sarah Reeves, Dept. of Conservation
Greg Reller, Tetra Tech
Michael Sawlan, National Bank Service
Wendy Silk, UC Davis
Rick Weaver, US Forest Service

Agenda:

I. Welcome, Introductions, and Agenda Review

II. Presentations:

Passive Treatment of Acid Rock Drainage: Emerging Technology or Proven Methodology – James Gusek, P.E., Golder Associates

Penn Mine Environmental Site Restoration – Eileen Fanelli, East Bay Municipal Utility District (EBMUD)

III. Announcements

IV. Next Meeting

Meeting:

I. Welcome, Introductions, and Agenda Review

Carol Atkins, Facilitator, welcomed Forum attendees. Meeting participants introduced themselves. The agenda was reviewed and no changes were made.

II. Presentations:

Passive Treatment of Acid Rock Drainage: Emerging Technology or Proven Methodology – James Gusek, P.E., Golder Associates

Doug Craig introduced Mr. Gusek, P.E., Senior Project Manager with Golder Associates based in Lakewood, Colorado. Mr. Gusek is a graduate from the Colorado School of Mines with a B.S. in Mining Engineering. His specialties are mine closure, mine lands reclamation and the design of passive treatment systems for mine-impacted water. Since 1987, Mr. Gusek has worked with acid rock drainage prevention and passive water treatments.

Mr. Gusek's presentation began with mine water treatment options, followed by their associated costs. The three basic options are:

- Active treatment
- Passive treatment
- A combination of active and passive treatments

Chemical addition, filtration and ion exchange are commonly used active treatment options. Mr. Gusek discussed the chemical aspects, the results of using an active treatment approach, and the cost associated with these options.

The passive treatment system components were discussed in great detail, followed by the importance of passive treatment to the sequential, ecological extraction of metals in a man-made but naturalistic bio-system. Metal removal mechanisms and their ensuing chemical reactions were discussed and shown throughout the presentation. Various examples of passive treatment currently in use and companies implementing passive treatment (e.g., the West Fork Lead Mine in Missouri), were provided. There are many challenges associated with implementing a mainstream treatment system, such as:

- Land surface availability
- System longevity and maintenance
- Disposal of residuals
- Performance criteria
- Odors
- Costs
- Not always working as designed.

The advantages of a passive treatment system are:

- Data collected shows that volunteer passive treatment systems from 80 to 150 years old have been identified.
- Sulfate reducing bacteria cells are expected to last 30 or more years.
- Aerobic cells could last indefinitely with periodic cleaning of iron hydroxide precipitates.
- Aerobic cells are powered by sunshine; anaerobic cells are powered by organic reservoir(s).
- Anoxic limestone drains are sized to last for 25 to 30 years.
- Oxide precipitates are typically stable.
- Sulfide precipitates/substrates appear stable (passing the Toxicity Characteristic Leaching Procedure (TCLP) test) after aging.
- Metal-laden substrates can likely be stripped of metals using lixiviates to render them non-hazardous.
- Residuals can be disposed of in a geochemical stable environment.
- Resource recovery research is evolving.

Why don't passive systems always work as designed?

- No design: No thought put into it
- Poor design: Undersized, incorrect geochemical approach, non-phased design, complex geochemistry, inadequate startup and operational procedures.
- Inadequate maintenance: Low maintenance does not mean no maintenance.
- Last minute changes to construction specifications can affect system performance.

Mr. Gusek ended his presentation by stating that any mine water can be treated… for a price. Passive treatment is HALF the cost of active treatment for identical chemistry. Passive treatment systems can handle a wide variety of flows, water, chemistry and site conditions (low to high: pH, metal concentration, flow and temperature). Their system longevity is on the order of decades, design processes are established and passive treatment is a proven methodology for treating acid rock drainage.

Penn Mine Environmental Site Restoration
Eileen Fanelli, EBMUD

Carol Atkins introduced Eileen Fanelli, Senior Engineering Planner for EBMUD. Eileen has been with the district for eight years and is a registered geologist. In her capacity at EBMUD, she manages capital programs at facilities that have significant environmental issues.

Eileen gave the audience a brief history and overview of the Penn Mine project. The Penn Mine site is located in the Sierra Foothills near the town of Campo Seco in

Calaveras County. The site itself covers approximately 22 acres on the southeastern shore of Camanche Reservoir, about 3-miles downstream of Pardee Dam. The site is located in the copper-zinc belt of the western foothills of the Sierra Nevada range. Historically, acid mine drainage (AMD) from tailings piles left on the ground surface at the Penn Mine flowed directly into Camanche Reservoir. Although various diversions were constructed to direct surface water around the tailings piles, AMD continued.

In 1995, an Environmental Impact Report (EIR) was drafted in order to develop a solution to the AMD problem at Penn Mine. The EIR was important for EBMUD to receive buy-in from the various stakeholders to the project.; In addition, EBMUD obtained some protection from future liability for any remedial work it performed through legislation; specifically SB1108, which allowed EBMUD to do work at the siteunder the auspices of a remediation agency, in this case the SWRCB. EBMUD did not and does not own the Penn Mine property. Remediation work began in 1997 and, by November 1999, construction and restoration was complete. Restoration activities within Mine Run Creek and Hinkley Run Creek included removal of the inline-treatment system and sealing of the Mine Run Dam mineshaft.

The objectives of the restoration were to restore the land to pre-mining conditions. EBMUD faced many challenges:

- Waste rock Removal: An estimated 375,000 yards of waste rock and tailings were excavated from the mine and Hinckley Run.
- Landfill Construction: The equivalent of a Class 1 landfill with a 6-acre footprint was constructed onsite to contain waste rock.
- Sealing of Shaft 4: Groundwater discharge was controlled in the area of Shaft 4 and reactive bedrock was encapsulated in Hinckley Run.
- Water Quality Monitoring: A comprehensive pre-,during- and post-restoration monitoring program based on the mass balance approach was implemented.
- Restoration: A 26-acre revegetation project including stream channel and side slope restoration were designed and constructed to return the site to its pre-mining condition.

Post closure activities include monitoring and maintenance of the landfill and the restoration areas.

III. **Announcements**:

Doug Craig:

- The Technical Group has completed its work and submitted a summary report to the California Bay-Delta Authority.

- The Legal Workgroup has completed a draft reference document that is undergoing revision.

- The Department of Conservation is working with the U.S. Army Corps of Engineers to identify future remediation projects and funding opportunities.

IV. Next Meeting:

May 19, 2004
9 a.m. - Noon
John Muir Conference Room
801 K Street, 20th Floor
Sacramento, Ca. 95814